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In the fall of 1966, the USOE Bureau of Research established the Consortium Research Development (CORD) Program, which was designed to assist small institutions of higher education in educational research and development activities. This program consisted of 26 small colleges co-linked together to form 6 consortia for carrying on instructional research. The first objective of the CORD Program was to bring together talent in the participating institutions so that mutual assistance would be available; the second was to stimulate faculties not normally involved in educational research activities to initiate such. Because it soon became apparent that more training for individuals in participating institutions was necessary, an intensive 2 week summer training session was undertaken. The first session, with a total of 61 participants from a diversity of academic backgrounds, was designed to develop competencies in 7 specific areas of educational research. From the 3 evaluation procedures used, including pre- and post-tests, this first session was generally successful. Tables and appendices present information concerning the session and its evaluation. Specific recommendations are made for future sessions. Although no claims are made that this training package is sufficient for producing professional researchers, it should assist the neophyte researcher in gaining enough basic competencies to facilitate his interaction with professional researchers and the concepts they employ. (DS)

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A PROJECT TO DEVELOP A PROGRAM AND MATERIALS FOR SHORT-TERM EDUCATIONAL RESEARCH TRAINING PROGRAMS

Project No. 7-I-055
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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education

Monmouth, Oregon

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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Introduction

In the fall of 1966, the Bureau of Research of the U.S. Office of Education implemented a program designed to help smaller institutions of higher education participate in educational research and development activities. This program, the Consortium Research Development (CORD) Program was predicated on the "conviction that a small, low-budget college can contribute to educational research as well as a big, rich college--if it has other small institutions to help." These small institutions have more than usual needs to participate in such research and developmental activities. In the first place, their instructional programs have the same need for evaluation and further development as do the larger institutions. Secondly, demonstrated capability to conduct grant-sponsored research is often viewed as positive evidence of an institution's excellence. Smaller institutions, however, are frequently frustrated since they often lack the necessary instructional research and development capabilities that are characteristic of their larger counterparts.

The CORD Program was initiated in the fall of 1966 with 26 small colleges co-linked together to form six consortia for carrying on instructional research. Institutions comprising the six consortia were located in North Carolina, North and South Dakota, Oregon, Tennessee, Mississippi, Virginia, New York and Wisconsin.

One of the objectives of CORD consortia was to combine available talent located in participating institutions in such a way that they could assist each other in common research, development, and evaluation activities that pertain specifically to instructional processes on the campus. A second objective was to stimulate these faculties, which are not characteristically involved in educational research activities, through exposure to educational

innovation and to the problems and techniques appropriate for various types of educational research, to initiate research activities. During the first year of the program faculty members, representing many subject matter disciplines, were exposed in various degrees to the world of educational research. As a result of this initial exposure it became clear that a more intensive form of instruction would be necessary if the faculty participants were to develop the necessary research competencies to profit optimally from the CORD activity.

The decision was made to coordinate this training activity through the provision of intensive short-term summer training in research and development competencies. Monies were provided by USOE to offer this specialized training. It was proposed that this training be conducted during a two week period late in the summer so that participating faculty members could fulfill their obligations to summer sessions at their institutions and also avail themself of this instruction. This project was initiated and completed to develop the instructional materials to be used in that institute and in succeeding institutes both for other CORD participants and similar faculty groups.

System Specifications

Because of the nature of the CORD program it was anticipated that there would be a wide variance in the abilities and experience of the participating faculty members. Thus it was necessary that the instructional system appropriate for such an audience be designed such that strengths and weaknesses of each participant in each of several topic areas be identified. Based upon this information the system was so designed that it would provide learners with the necessary background experience and individualized program required to make the training period one that would lead to optimal

acquisition of the basic skills needed to become involved in educational research and innovative development activities. The system was further designed to operate with a very small student-teacher ratio and to provide an abundance of materials such that each participating faculty member could be provided with a program suited to his individual needs.

The problem of diversity in the population relates most directly to the amount of learning to be accomplished by each individual during the time available. Individuals with extensive experience in the physical and life sciences might be expected to require very little additional experience in such topics as Research Design and Data Analysis. Those with extensive experience in English and the Humanities might be expected to require very little additional training in the creative writing tasks involved in proposal and report writing, stating objectives in behavioral form, and the preparation of prototype instructional material. It seemed unlikely, however, that very many participants, since they come from a wide diversity of discipline backgrounds, would have developed related competencies in all skill areas relevant to conducting educational research. This is especially true for topics such as Test Construction, Task Analysis, and Prototype Development. It was anticipated that all participants would profit from a reorientation of their present competencies and experiences to the context of Behavioral Science.

Objectives of the Instructional System

The Instructional System developed as a result of this project was designed to develop competencies in the following areas:

1. Specifying objectives in behavioral criteria and form. This includes the statement of objectives for instructional systems design purposes, the modification and refinement in developmental phases, and their revision and simplification for dissemination.

2. Task analysis and instructional specifications. This includes information on hierarchical task analysis and techniques for specifying the instructional requirements of various kinds to achieve task related behaviors.

3. Prototype Development. This includes the experimental operations and procedures, development of external control strategies, instructional monitoring procedures, and evaluation-revision cyclical operations, employed to maximize the learning effects of each instructional element.

4. Measurement. This includes information on the procedures used in the selection and development of appropriate criterion measures for various types of behavioral objectives, and techniques for assessing absolute criterion performance vs. relative student performance.

5. Research design. This includes information on "within group" variance and the identification of learner variables relevant to the learning experience; manipulable and nonmanipulable variables; examples of research models; alternative experimental designs; sources of invalidation; and operations research methodology.

6. Data analysis. This includes selection of appropriate statistical techniques for analysis of the evaluation and/or experimental data and the use of computers in the process of analysis.

7. Proposal and report writing. This includes information regarding components of the research proposal; use of operational language; the key role of evaluation of the educational product, and/or the experiment itself--including limitations, inferences, implications, and description of new questions raised and additional experimentation required.

Development of the Prototype Instructional System

The general content areas as described on the preceding pages were covered in the instructional system which was comprised of nine modules. The nine modules included in the instructional system and the staff member from Teaching Research responsible for the development of each module is listed in Table I.

Table I
Instructional Modules and Authors

Instructional Module	Author
1. Orientation and Overview	Dr. Jack V. Edling
2. Specifying Objectives	Dr. Casper F. Paulson
3. Test Construction	Dr. Del Schalock
4. Task Analysis and Instructional Specification	Dr. Paul A. Twelker
5. Prototype Development	Dr. Dale G. Hamreus
6. Research Design	Dr. John Gordon
7. Data Analysis I	Dr. James H. Beaird
8. Data Analysis II	Dr. James H. Beaird
9. Proposal and Report Writing	Dr. Jack Crawford

The completed instructional system was designed to include the following elements for each instructional module: (a) a self-instructional unit designed to provide each learner with information covering the topic area as defined by the behavioral objectives for that module, (b) a set of related problems designed to permit the learner to apply the information in the Self-Instructional Unit to typical problem situations, (c) a criterion test covering the behavioral objectives included for the module and for a list of references which would permit the learner to pursue further in-depth study of the content covered in

the instructional module. The instructional system was designed in such a way that it could stand on its own as a self-instructional system or could be utilized in a group learning situation. The inclusion of criterion tests for each instructional module permitted identification of those learners who would require additional assistance or self-study if they were to demonstrate achievement of the behaviors covered in the various modules.

Because of the length of the complete instruction system those materials are not included in this report. Materials are available from Teaching Research under the title National Research Training Institute Manual. The application problems which can be used by the instructor in an in-class situation or by the learner in a self-learning situation are available from Teaching Research under the title National Research Training Institute Workbook. The criterion exams prepared for each unit appear in Appendix A of this report.

Trial of the Instructional System

A total of 61 participants were exposed to the Instructional System. Of this group, 52 were college professors selected by various U.S. Office of Educational Regional Research Directors from those institutions of higher learning cooperating in the CORD Program. The remaining nine participants were U.S. Office of Education observers representing the Regional Research Program and the Bureau of Research. The participants represented a diverse population of interests. The disciplinary backgrounds of the participants exclusive of the USOE representatives are shown in Table II.

Table II
Disciplinary Background of Participating College Professors

Discipline	N
Education	14
Higher Education Administration	10
Biological Science	4
Mathematics	4
English	3
American Studies	2
History	2
Natural Science	2
Psychology	2
Sociology	2
Business	1
Communication	1
Economics	1
Guidance	1
Music	1
Religion	1
Speech	1

Of the 52 college professors, only four had never had a course in psychology. Twenty-one of the participants had, at some time, written and submitted

for funding at least one research proposal related to the improvement of instruction. Of this number, 19 had been funded on one such proposal.

The learner population was divided into two sections so that group instruction could be provided to no more than thirty individuals. Assignment to sections was made on a random basis. All participants were provided with a set of the self-instruction materials. Participants were provided with an opportunity to utilize the self-instruction materials before the topic was presented by the instructor.

Each day the learners were exposed to one instructional module in a group paced program sequence in the Teaching Research Automated Classroom (TRAC). At the completion of the group-paced presentation, participants were administered a criterion test for that topic. Based on their scores on the criterion test participants were scheduled to either a small group seminar or an individual instructional experience. Those individuals who demonstrated competence on a given topic were given the opportunity to work on a research related activity in an area of their own interest. Those who did not demonstrate competence on the criterion examination worked directly with a staff member in review of the content until such time that the participant and the instructor were satisfied that competence had been achieved. The typical daily schedule was as follows:

8:00 - 9:45 A.M. Group-paced presentation in the TRAC facility. This was a carefully prepared pre-tested learning experience on one of the instructional modules requiring active response from the participants and providing feedback to the presenter on the percentage of students responding correctly to the problem situations as well as an individual record of the errors made by each participant student.

9:45 - 10:00 A.M.	Break
10:00 - 11:00 A.M.	Administration of the criterion test. The scores on each criterion test were used to group the students hcmogeneously for further study on the contents of that instructional module.
11:00 - 12:00 Noon	Independent and small group study. Individuals experiencing difficulty in common sub-topics worked together under the guidance of a staff member in an individual tutorial or seminar type situation in order to gain confidence in the specified behaviors.
12:00 - 1:30 P.M.	Lunch
1:30 - 4:00 P.M.	Independent and small group study. This was a continuation of the work undertaken in the morning. Some individuals demonstrated sufficient competence in the topic to apply the behavior to the development of a research proposal and/or set of materials relevant to his own area of interest.
4:00 - 5:00 P.M.	Group meeting (Interaction). This session was devoted to dialogue wherein ideas and topics of the day were examined and in which reaction, comments, questions, relevant to those topics were raised and discussed by the participants.
7:00 - 10:00 P.M.	Independent study. During this period the participants studied the self-instructional materials for the instructional module scheduled for the next day.

Results

Three forms of evaluation of the system were employed: 1) a simple pre- post-test design based on scores on the criterion measure to determine what learning gains resulted from the system; 2) participants' written appraisals of the system on a prepared evaluation form (see Appendix B); and 3) participants' summary and evaluative comments obtained during the final two hour institute session devoted specifically to that purpose. Each of these evaluations will be summarized below.

Evaluation 1: Pre- post-test gain scores

The following design was established for the pre- post-test measure of evaluation. Prior to arrival, participants were randomly assigned to either one of two sections. Section 1 did not receive a pre-test, experienced the instructional system and was administered a post-test. Section 2 was pre-tested, experienced the instructional system, and did not receive the post-test. The results of pre- post-test scores on criterion measures for each instructional module and total scores of all measures are shown in Table III, (see the following page).

Inspection of Table III reveals that post-test mean scores were higher than pre-test means in all cases. Although mean scores were not comparable between criterion measures, the smallest relative mean gain occurred in the Objective Analysis Section; whereas the greatest relative mean gain resulted in the Data Analysis II Section. Tests of significance were not made since the study did not involve hypothesis testing; however, the size of differences between means for nearly all measures was sufficient to indicate that changes in behavior in the desired direction did occur and were sufficiently large to insure statistical significance.

Table III

Means, Standard Deviations, Ranges, and Total Possible Points of All Separate Criterion Scores and Total Test Scores for Pre- and Post-Test Measures.

Criterion Measure		N	Mean	Standard Deviation	Range	Total Points Possible
Behavioral Objectives	Pre	24	31.29	11.16	7-47	60
	Post	25	50.88	6.41	35-58	
Objective Analysis	Pre	24	10.67	1.86	7-14	18
	Post	25	13.84	2.51	6-17	
Instructional Development	Pre	24	15.08	4.53	10-22	44
	Post	25	31.12	6.74	17-41	
Measurement	Pre	24	12.52	2.65	8-16	44
	Post	25	24.32	4.05	15-29	
Experimental Design	Pre	22	1.45	1.77	0-6	7
	Post	23	5.98	1.25	2-7	
Data Analysis I	Pre	24	6.50	2.52	1-11	20
	Post	25	17.48	2.20	10-19	
Data Analysis II	Pre	24	1.58	2.94	0-8	16
	Post	24	12.71	2.50	5-15	
Total, all Measures	Pre	22	79.38	19.05	41-115	209
	Post	22	156.75	18.53	104-178	

Evaluation 2: Individual Written Evaluation of the Training System

The second form of evaluation required participants to rate each institute topic -- the written portion and the group presentation -- on a five point scale. Summaries of those ratings are shown in Table IV, (on the following page).

From Table IV it can be seen that participants rated nearly all topics and modes of instruction at about a four point level. One exception was that of the written materials for proposal writing. Ratings for this section averaged 4.7 -- nearly perfect. The high rating given the proposal writing written materials along with other general comments received in the institute

suggests that participants were particularly interested in obtaining these materials and felt they were a high priority need in their subsequent proposal writing efforts.

Table IV

Participants' Average Ratings On a 5 Point Scale of Each Institute Topic: Written Materials and Group Presentations

TOPICS	WRITTEN MATERIALS	GROUP PRESENTATION
Orientation	4.1	4.1
Objectives	3.9	3.9
Objectives analysis	3.9	3.5
Measurement	4.1	4.3
Instructional Systems Development	4.1	4.1
Research Design	4.1	4.1
Data Analysis I	4.1	4.3
Data Analysis II	4.3	4.1
Proposal Writing	4.7	4.1

General reactions to the instructional system were favorable. Several typical comments follow:

"As future research directors in our own institutions, we were made aware of some of the problems in research."

"The system offers a great opportunity to have expert instruction concentrated in depth and supervised practice in applying new skills in each area of research training."

"Provided us valuable material to bring home."

"Would like to see the training extended with more time to assimilate."

"Would recommend to other faculty."

Evaluation 3: Group Oral Evaluations of the Training

The third form of evaluation consisted of a two hour group meeting with participants and staff to summarize and evaluate the training. Again, as was noted earlier, the most notable outcome from this experience was the wide

variance of difference among participants in terms of their opinions about the two weeks training just completed. Areas discussed were the written materials, class presentations, testing, pre-session activity, small group study, topic schedule sequencing, and participant grouping.

Some participants felt that the various sections of the written materials should have more editorial consistency, others argued to keep the individualization of authors. One suggestion commonly agreed upon was the desire to have a common example carried systematically through each section of the written materials. No agreement could be reached, however, regarding what type of example should be used or what discipline should be represented.

Many participants expressed a desire for some form of follow-up for advanced training. Suggestions were made for an advanced institute, a pre-session at the National Convention of the American Education Research Association, and short, small group regional training sessions by the institute staff to be coordinated, whenever possible, during any professional trips made to different parts of the country.

General agreement was expressed that more value than just personal skill attainment emerged from the experience. Participants indicated that they acquired broader skills with which to help others at their home institutions in the preparation of proposals and the conduct of instructional research.

General Conclusions

On the basis of the evaluations just reviewed and the experience of the staff in carrying out the training, the following conclusions have been made. Suggested changes, if a similar institute were to be conducted, are offered.

a. Objectives. In general, the evidence supports the conclusion that all objectives of the program were achieved. No major changes in objectives are recommended.

b. Content. The content appeared appropriate for the participants in attendance; however, additional attention to individual differences in small group activities would be desirable for future formal use of the system. Need for development of diagnostic tests to be administered after participants experience each major topic, was indicated. The assessment of participants' behavioral changes resulting from such diagnostic testing would strengthen the system of guiding participants into small groups and independent study sessions.

c. Organization. Although participants differed in their opinions about length of program, the conclusion drawn is that two weeks was about the right amount of time to accomplish the objectives of training. Future use of the program should be accompanied with more detailed instruction to participants in their use of study time. For example, although it was clearly announced at the orientation session that all trainees were free to do what they felt was most helpful during the half day time periods devoted to small group study, few did anything different than attend the small groups to which they were assigned. Several participants did express a desire to have devoted this time period to other study efforts. It appears necessary to explicitly set forth various study alternatives available to trainees and counsel them into which alternative they wish to select.

While these materials were developed for a specific group of learner-participants (faculty members in colleges and universities which are involved in CORD consortia), the system has been utilized with other audiences on more limited bases. The general conclusion is that the materials can be employed

with populations beyond the original target audience.

There are no claims made that this training package is in and of itself totally sufficient in producing professional researchers. It will, however, assist the naive researcher to gain enough baseline competence to facilitate his interaction with professional researchers and the concepts they employ.

APPENDIX A

Behavioral Objectives Test

I.

1. One way in which a written behavioral objective for teaching may differ from a non-behavioral objective is that the behavioral objective always specifies:
   A. Teaching methods
   B. Teacher behavior
   C. Length of a teaching unit
   D. Criteria for measurement.

2. An "objective," as it has been defined for the purposes of writing behavioral objectives, denotes:
   A. A goal that a teacher intends students to accomplish
   B. A desired goal for students to accomplish
   C. A goal for teachers to accomplish in their teaching methods
   D. A goal teachers would like to accomplish with their students

3. Generally, the most valid indications of student behavior that are related to a behavioral objective are those which:
   A. Reflect the objective indirectly
   B. Foster democratic ideals
   C. Allow the student to express himself
   D. Are linked directly with the objective

4. The following verbs might be used in writing behavioral objectives concerning the testing of geography. Which verb would require the least clarification in a behavioral objective?
   A. Understand
   B. Draw
   C. Locate
   D. Identify

5. The following verbs might be used in writing a behavioral objective for teaching high school English. Which verb would require the least clarification of a behavioral objective?
   A. Write
   B. Appreciate
   C. Illustrate
   D. Summarize

6. In a behavioral objective, the audience is:
   A. All the students in a particular grade or level
   B. Some of the students in a particular grade or level
   C. A group of students who are expected to reach the criterion in the behavioral objective
   D. A group of students who behaved as the objective indicates

7. The "conditions" of a behavioral objective specify
   A. The setting in which the students' behavior is to occur
   B. The actions which the teacher will observe
   C. The actions of the leader
   D. Criteria for measuring the student behavior

8. The "behavioral" aspect of a behavioral objective specifies:
   A. Teacher behavior
   B. Pupil behavior
   C. Behavioral conditions
   D. Measurement of behavior

II.

From each of the following groups of objectives select the one objective which is most nearly stated in behavioral terms.

9. A. To teach the students how to build a 3 x 5 inch jewel box...
   B. The student will learn the principles of constructing small boxes...
   C. Each 10th grade shop student will build a 3 x 5 inch jewel box...
   D. To show 10th grade students the proper way to construct a 3 x 5 inch box...

10. A. To remember the names of the ten provinces of Canada in such a way as to...
    B. To learn and remember the names of the ten provinces of Canada...
    C. To name and label the ten provinces of Canada on a blank map showing only...
    D. To appreciate the importance of the ten provinces of Canada...

11. A. To learn the names of the different latitudes of...
    B. To write on an outline map the names of the different latitudes of...
    C. To know the names of the different latitudes of...
    D. To remember how to identify the different latitudes of...

12. A. To teach the fundamentals of diagraming electrical circuits...
    B. To learn the fundamentals of diagraming electrical circuits...
    C. To diagram an electric circuit with all the fundamentals...
    D. To know how to diagram an electrical circuit.

13. A. To define the terms decagon, geometry, and equilateral...
    B. To learn the terms decagon, geometry and equilateral...
    C. To know the concepts decagon, geometry and equilateral...
    D. To understand the terms decagon, geometry and equilateral...

14. A. To explore the identification of various types of vegetation...
    B. To name and describe in writing ten types of vegetation...
    C. To learn the names of ten different types of vegetation...
    D. To know the names of ten different types of vegetation...

15. A. To point out five essential points on a map...
    B. To learn about five essential points on a map...
    C. To know and understand five essential points on a map. .
    D. To appreciate the value of knowing five essential points on a map...

III.

From each of the following groups of behavioral objectives select the one that most accurately describes the desired behaviors.

16. A. Locate ten major oceans, bays and straits on an outline map.
    B. Identify ten major oceans, bays and straits on an outline map.
    C. Write the names of ten major oceans, bays and straits on an outline map.
    D. Be able to recognize ten major oceans, bays and straits on an outline map.

17. A. To send a four-word message by Morse code with a blink light.
    B. To send a Morse code message.
    C. To send a message with a blink light.
    D. To send a message using a code.

18. A. Must be able to read Spanish writing.
    B. Must translate Spanish into English verbally.
    C. Must read a Spanish paragraph and translate orally into English.
    D. Must be able to tell the differences between languages.

19. A. Must write a Campbell style library paper of at least ten pages.
    B. Must show an ability to write a library paper.
    C. Must write a Campbell style library paper and finish it.
    D. Must be able to write a paper of ten pages or more.

20. A. Must give 4 examples of methods used to teach biology.
    B. Must write examples of 4 basic instructional techniques in biology.
    C. Must demonstrate an ability to teach biology 4 different ways.
    D. Must show 4 examples of how to teach biology.

21. A. Find the ten largest cities in Canada.
    B. Locate the position of each of the ten largest cities in Canada.
    C. Write a list containing the ten largest cities in Canada in order of size.
    D. Recognize the rank of each of the ten largest cities in Canada.

22. A. Write on an isothermal map with a red pencil accurately.
    B. Find the three spots on an isothermal map with heaviest rainfall.
    C. Mark with a red pencil the 3 areas on an isothermal map with heaviest rainfall.
    D. Locate and recognize areas of heavy rainfall on an isothermal map.

IV.

From each of the following groups of statements select the one which most clearly specifies an acceptable level of performance.

23. A. To write a topic sentence suitable for three given related sentences.
    B. To write a good topic sentence without error.
    C. To write accurately a topic sentence in 3 minutes.
    D. To write a sentence for any topic.

24. A. To obtain a score of 50% on a final test for the course.
    B. Get a score of 50 or more on a 100 item final.
    C. Score better than at least half the class on the final test in this course.
    D. Must be able to answer correctly at least 50% of the items on a 100 question true-false test.

25. A. Write the names of the Canadian provinces on an outline map.
    B. Write the ten provinces on an outline map provided in class.
    C. Write the names of at least 7 of the 10 Canadian provinces in a 5 minute period.
    D. In five minutes write the names of ten provinces on a Canadian map.

26. A. To underline verbs in sentences accurately.
    B. To locate and underline verbs in sentences correctly.
    C. To underline all verbs in 10 sentences in 15 minutes with 2 or fewer errors.
    D. To write all verbs from 10 sentences on a separate sheet of paper.

27. A. By labeling a given outline map of waterways correctly within ½ hour.
    B. By being able to look at an outline map and locate waterways correctly.
    C. By placing waterways on an outline map accurately.
    D. By labeling without error all the waterways on an outline map in 30 minutes.

28. A. Must compute accurately to 1 decimal place at least 20 of 30 given division problems.
    B. Must work out long division problems in such a way as to demonstrate ability.
    C. Must finish accurately an assignment calling for solution of long division.
    D. Must be able to work 20 long division problems in 30 minutes.

29. A. Must be able to keep time to a given record of music.
    B. Must clap hands in 4/4 rhythm through ten bars of "Ten Little Indians."
    C. Must correctly clap in 4/4 rhythm, 4 counts in each measure, to a recording of "Ten Little Indians."
    D. Must be able to demonstrate the ability to keep time to a given record.

V.

From each of the following groups of statements select those which describe a <u>condition</u> under which an objective is to be measured.

30. A. Must be able to identify cones, cylinders, and prisms.
    B. Given a set of geometric shapes
    C. Within a period of 30 minutes with less than 3 errors
    D. Students in a 10th grade Geometry class

31. A. Without the aid of references
    B. 33 correct out of a possible 50
    C. 9th grade geography students
    D. Select the proper location of major rivers.

32. A. Compute the area of a circle.
    B. Without the aid of a slide rule.
    C. Following the proper formulas.
    D. 9th grade algebra students.

33. A. Given a problem of the following class.
    B. Select the correct answer in 60% of the class.
    C. Be able to answer correctly
    D. The entire 12 grade calculus group

34. A. In a period of less than 1 hour
    B. Without the aid of a reference map
    C. Find the location of a major continent
    D. Correctly in 40% of all cases

35. A. By arranging parallel lines on a given map
    B. The student will identify and label
    C. Three of the basic map projections
    D. Will spell all three correctly in a period of 5 minutes

36. A. The student will solve an algebraic equation
    B. Given a linear equation with one unknown
    C. Within a period of 40 minutes
    D. And follow the correct procedures

VI.

Each of the following statements is a part of a behavioral objective. For each statement select the answer which best describes what the statement refers to in the objective.

37. ..within a period of 20 minutes...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

38. ..the first year college geography class...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

39. ..given a set of carpenters tools...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

40. ..without the use of references...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

41. ..all auto repair men in electrical circuiting will...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

42. ..locate and label...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

43. ..with a slide projector and slides...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

44. ..identify the areas containing salt, phosphorous and...
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

VII.

The following behavioral objectives are followed by a list of the four basic requirements necessary for a well stated objective. Select that requirement which you feel is <u>least</u> adequately met, or has been omitted altogether.

45. The sixth grade social studies student, given a slate outline map, will write the names of continents on it.
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

46. Given roughly circular shapes with various arrows indicating direction the student shall select without error in a 5 minute period all those whose arrows indicate a clockwise rotation.
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

47. The ninth grade social studies student will locate and name at least 4 of the 5 climatic areas of Canada.
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

48. By the end of two months they should be able to type 20 words per minute for a period of five minutes with less than three errors.
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

49. On an outline map provided, ninth grade geography students will identify and label the major rivers of the U.S. and Canada.
    A. Audience
    B. Behavior
    C. Condition
    D. Degree

VIII.

In the most of the following statements of behavioral objectives one or more parts have been worded badly or left out completely. For each one select the part or parts you think are inadequate and mark the appropriate response(s).

50. The student should know the names of three mathematicians and contribution of each to geometry.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

51. Each student will write a topic sentence suitable for three given related sentences.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

52. The student will identify at least three key steps in the proof of "The square root of two is an irrational number."

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

53. Given a subject which is consistently classified under the same number, to tell from the card catalog where to look for books in that subject. (Give call number as far as it consistently occurs.)

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

54. Students show perception of tonal relationships within a scale (major or minor) by singing with syllables or numbers, a familiar song at a tempo established by the teacher.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

55. Given twenty notes written on a staff on the board with the bass clef, the class must write down the names of these notes in one minute, as indicated by teacher's start and finish signals, based on teacher's stop watch.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

56. Given the titles of five books, to locate the names of the authors in the card catalog and write down the authors and titles in acceptable bibliographical form.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

57. Each student will give the root meaning of the terms "geometry," "quadrilateral," "decagon," "circumference," and "inscribed."

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

58. The student will identify all basic shapes (cylinder, cone, prism, cube, and sphere) used in familiar buildings and structures.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

59. Spell correctly the following words after a 20 minute oral study period: cat, dog, bull, white, store. This will be a written exam which will last 5 minutes.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

60. At the end of the two week library session, the pupils will locate, by the use of the card catalog, five books named by the instructor. A maximum time of five minutes will be allowed.

A. Audience
B. Behavior
C. Conditions
D. Degree
E. All of these
F. None of these

Objective Analysis
Criterion Test

1. Which of these is a benefit of pre-design in contrast to extemporaneous design?

   a) early planning is diminished.
   b) restoration of the proper emphasis of teacher functions is facilitated.
   c) student study tasks are more closely monitored.

2. A programed instructional booklet exemplifies:

   a) a superficial choice of terminal objectives.
   b) intentional extemporaneous design of the conditions of learning.
   c) pre-design of the conditions of learning.
   d) a wide range of enabling objectives.

3. Pre-design of instruction is a waste of time.

   a) agree
   b) neutral
   c) disagree

4. Since we do not know enough about the learning process, it is impossible to pre-design instruction to make it more effective.

   a) agree
   b) neutral
   c) disagree

5. The best use of an instructor's time is to know his subject matter thoroughly rather than to worry about how to teach it.

   a) agree
   b) neutral
   c) disagree

6. A student is cheated if he goes to a class when instruction is not pre-designed.

   a) agree
   b) neutral
   c) disagree

7. Pre-design is a poor substitute for extemporaneous design.

   a) agree
   b) neutral
   c) disagree

8. Pre-design will do alot to improve instruction.

   a) agree
   b) neutral
   c) disagree

9. If I had my way, all instruction would be pre-designed.

   a) agree
   b) neutral
   c) disagree

10. In many subjects, extemporaneous design is all right.

    a) agree
    b) neutral
    c) disagree

11. An objective analyses may produce a "good" hierarchy or a "not-so-good" hierarchy. In the long run, a "good" hierarchy is one that

    a) has many levels correctly positioned.
    b) includes enabling objectives that are easily accomplished by learners.
    c) help the instructor in determining what to teach, and in what sequence to teach it.

12. Which of these terms does not describe "enabling objectives"?

a) Basic factual and conceptual knowledge.
b) Component behavior or skills.
c) Lower order competencies.
d) Format of the instruction.

13. After identifying the enabling objectives the next step is to:

a) Identify the type of learning involved in each objective.
b) Develop an instructional environment which will transform learners into graduates who can perform at the specified level.
c) Design instructional sequences that reflect the basic learning principles.

14. After establishing the terminal objective (s) the designer should ask the following question.

a) What level on the hierarchy of learning is this objective?
b) What media will best facilitate reaching this goal without losing the individualized approach?
c) What would the student have to know to perform this objective successfully?
d) What in the world do I do now?

15. Below is a set of objectives. Two of these are enabling objectives. One is a terminal objective.

1) Represent forces and their directions as parts of triangles.
2) Name parts of a triangle.
3) Name horizontal and vertical components of forces as vectors. Which is a terminal objective?

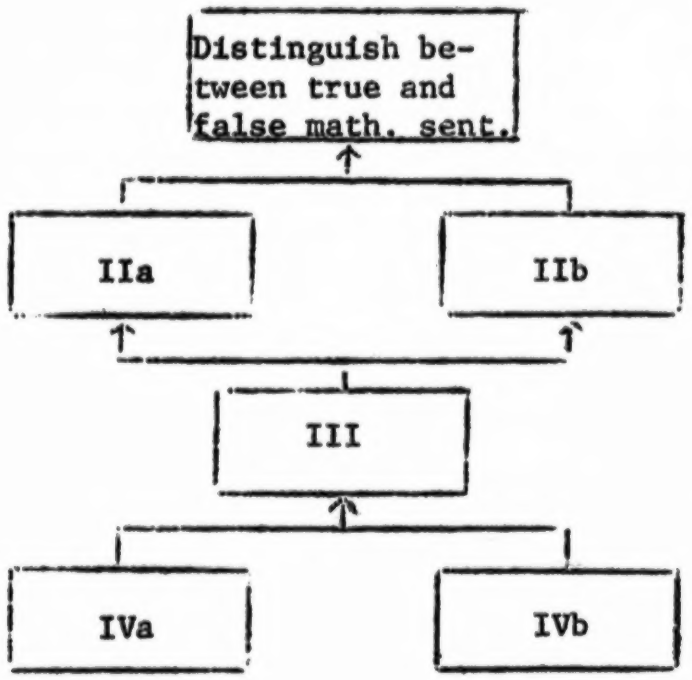
a) 1
b) 2
c) 3

16. Below is a set of objectives. One is a terminal objective and the others are enabling objectives.

1) The student will make a left turn with a standard shift car onto a highway from a stop.
2) The student will discriminate the clutch from the gas pedal and the brake.
3) The student will disengage the clutch.
4) The student will signal for a left turn. Which of the following is a terminal objective for this set?

a) 1
b) 2
c) 3
d) 4

17. In the following objective analysis, choose the correct ordering of enabling objectives.



1. Distinguish between equal and unequal expressions.
2. Perform operations of multiplication and division
3. Recognize false math sentences
4. Recognize the math sentences
5. Recognize true math sentences

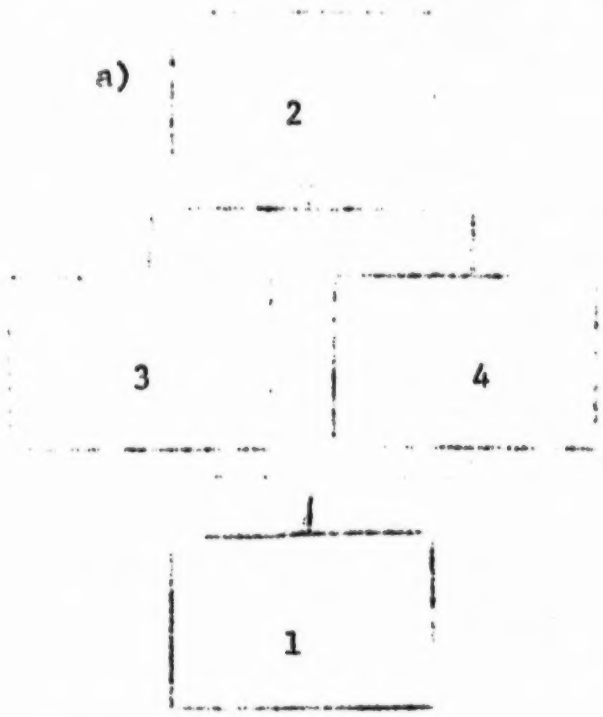
	a.	b.	c.	d.
IIa -	1	2	5	3
IIb -	4	1	3	5
III -	2	4	2	4
IVa -	5	3	4	1
IVb -	3	5	1	2

18. Read the following list of objectives for a math problem.

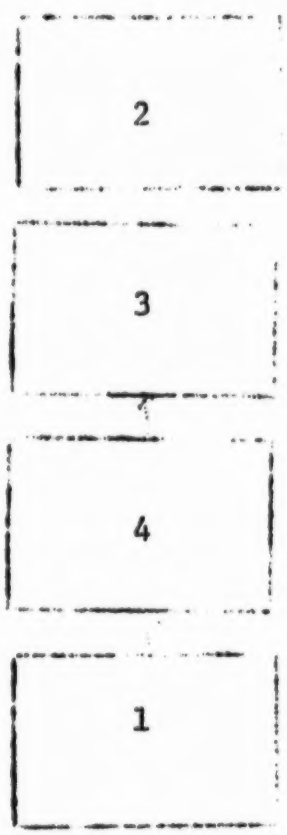
1) Read 1 and 2 place numerals.
2) Multiply a two place whole number by a one place whole number.
3) Multiply a one place whole number by another one place whole number.
4) Add a group of ten (s) to a two place whole number (carrying).

Which diagram is closest to revealing the hierarchy? (The numbers in the squares refer to the numbered objectives above.)

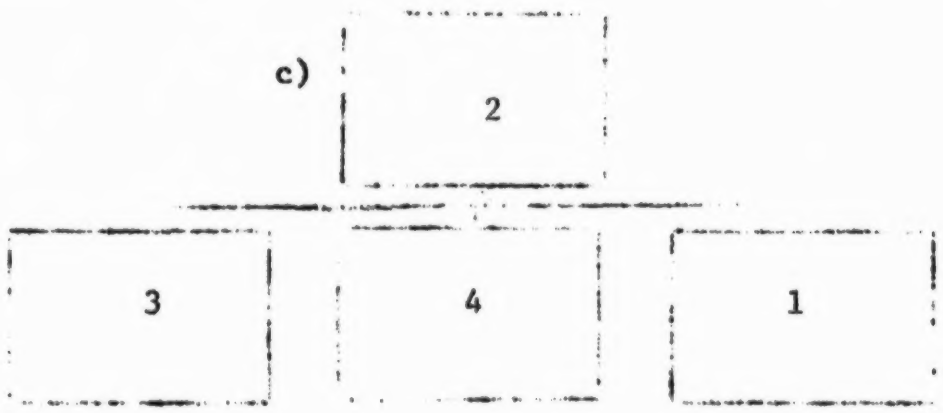
a)



b)



c)



Prototype Development

Criterion Test

For test items 1 - 8, circle the answer you consider best; then push the same letter button on your response station.

1. The stages defined in the instructional system development section are:

   A. Identify behavioral objectives; determine enabling objectives, produce the instructional product; analyze tryout results.
   B. Produce instructional product; conduct tryout of product; analyze tryout results; modify product; recycle.
   C. Determine enabling objectives; produce instructional product; construct performance measures; conduct tryout; analyze results; recycle.
   D. Produce instructional product; construct performance measures; conduct try-out; analyze results; recycle.

2. The process of systematically following the instructional "blue prints" or specifications is to:

   A. Produce the instructional product
   B. Identify types of learning
   C. Identify behavioral objectives
   D. Conduct try out of the product

3. To translate the analysis of try-out results into changes in the instructional materials is to:

   A. Determine enabling objectives
   B. Produce the instructional product
   C. Recycle the development process
   D. Modify the product

4. Obtaining data from observations and other evaluations of the system such that weaknesses can be identified is to:

   A. Construct performance measures
   B. Determine enabling objectives
   C. Conduct try-out of the product
   D. Analyze try-out results

5. The stage of instructional system development whose purpose is to determine whether the instructional system achieves its objective is the:

   A. Analysis of try-out results
   B. Identification of events that provide conditions of learning
   C. Determination of enabling objectives
   D. Production of the instructional product

6. Recycling is concerned with

   A. Determining enabling objectives for all behavioral objectives
   B. Administering and analyzing performance measures
   C. Modifying all phases of the instructional product
   D. Reduplicating all instructional system development stages

7. The team of specialists considered essential to produce the instructional product includes a:

   A. Content specialist, media specialist, behavioral scientist
   B. Production specialist, measurement specialist, field monitor
   C. Subject matter specialist, field monitor, liaison
   D. Production specialist, try out specialist, measurement specialist

8. The continuum of experience model is most useful in

   A. Constructing performance measures
   B. Interpreting results of the try-out
   C. Deciding what media to use
   D. Deciding how to conduct the try-out

For test items 9 - 16, circle whether the statement is true or false and push the same letter button on your response station.

9. Try-out of the instructional product occurs after all development has been completed.

   A. True
   B. False

10. Try-out of the instructional product should only be conducted with learners of appropriate grade and ability level.

A. True
B. False

11. Analysis of try-out results cannot put more confidence in test results than in comments from try-out subjects.

A. True
B. False

12. High error rates on a criterion test indicate the instructional system has portions that are relatively ineffective.

A. True
B. False

13. Try out following instructional system modification is crucial.

A. True
B. False

14. If it is possible, the same subject should be used to try-out all revisions of a particular segment of the new instructional system.

A. True
B. False

15. Product development requires translating instructional specifications into written statements and/or media forms.

A. True
B. False

16. Incidental details having little to do with the basic content of the new instructional system often interfer with effective learning during the try-out.

A. True
B. False

For test items 17 - 23, circle the answer you consider best: when all persons have completed these items you will be instructed to push the appropriate button on your response station.

17. Analysis of try-outs is used to:

    A. Plan modifications to the system
    B. Determine weak teaching strategies
    C. Determine unrealistic specifications
    D. All of these
    E. None of these

18. To measure the first try-out of a segment of a new instructional system

    A. requires a validated test
    B. Demands small groups
    C. Involves only learners
    D. All of these
    E. None of these

19. Modifications to the new instructional system following analysis are planned with:

    A. The same team of specialists used in production
    B. A new team of specialists
    C. The content specialist only
    D. All of these
    E. None of these

20. The process of producing the instructional product involves

    A. Systematically following the instructional specifications
    B. Translating specifications into prototype
    C. liaison between a team of specialists
    D. All of these
    E. None of these

21. To modify the instructional materials following try-out requires

A. Translating the analysis results into changes in the product
B. Planning with the development specialist team
C. Revising enabling objectives
D. All of these
E. None of these

22. In teaching learners to discriminate between sounds produced from an oboe and an English horn, according to the continuum of experience model, use

A. Direct experience
B. Objective codification (audio)
C. Subjective codification (audio)
D. All of these
E. None of these

23. Results of an analysis of the total instructional system indicates that learners achieved all the stated enabling objectives but did not achieve the terminal objective. Which interpretation would be appropriate

A. Enabling objectives were irrelevant to the terminal objective
B. Enabling objective stated required learning steps that were too big.
C. Enabling objectives were too easy
D. All of these
E. None of these

24. During the first session in the Institute on Specifying Behavioral Objectives you wrote two objectives in the area of your discipline. For this part of the test, copy one of those objectives in the space below and do the following: First, identify <u>one</u> enabling objective necessary to attain the terminal behavior you stated. Then:

A. Describe how you would proceed to produce the instructional segment for that enabling objective.
B. Detail how you would plan to try-out the segment produced. In your discussion give consideration to all pertinent aspects of production and try-out covered in this section.

25. The section that follows contains a series of frames taken from a self-instructional program designed to teach 6th grade students concepts and principles of latitude and longitude. Below the frames is a summary of the error rates for each frame resulting from a tryout of the materials with low, average and high ability students drawn from the 5th, 6th and 7th grades. After studying these materials,

A. Judge which frames were bad for which students. (Consider acceptable frames as those not exceeding an average error rate of 14.)

B. Write a brief statement (approximately 100 words), based on the evidence available, indicating what you think caused the frames to be faulty.

C. Briefly describe the steps you would take next to modify the faulty frames.

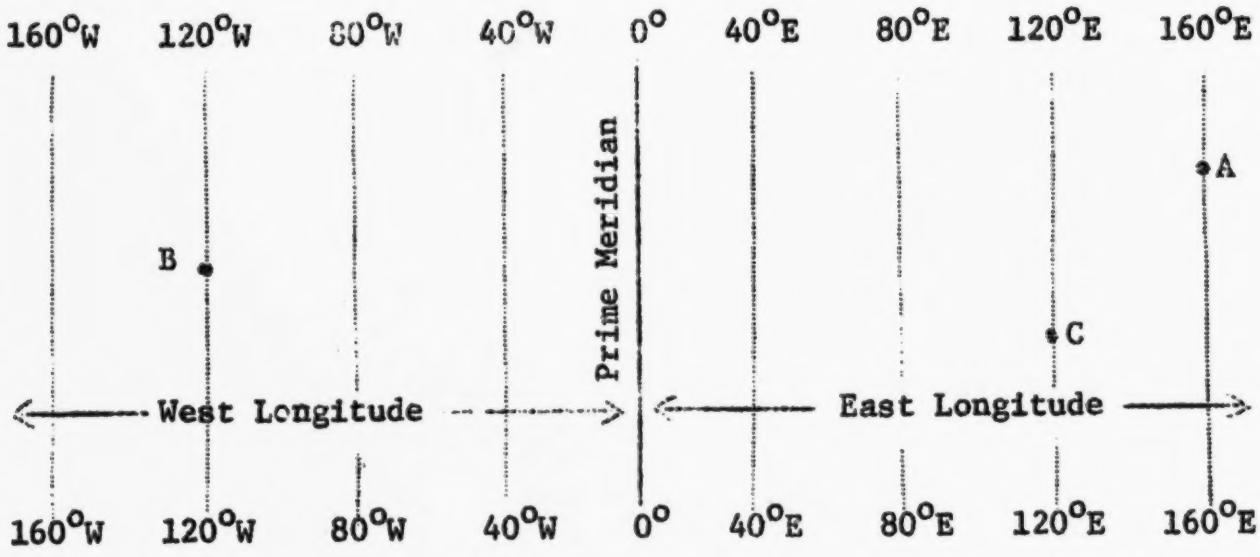


Figure 10

8-30 Look at Figure 10. The longitude of Point A is written_____(?)_____. 160°E

8-31 The longitude of Point B on Figure 10, is written_____(?)_____ 120°W

8-32 The longitude of Point C on Figure 10 is written_____(?)_____ 120°E

8-33 Longitude is __(?) - (?)__ distance or location. east-west

8-34 Longitude lines are numbered from 0 at the _____(?)_____ meridian to __(?) °____. prime; 180°

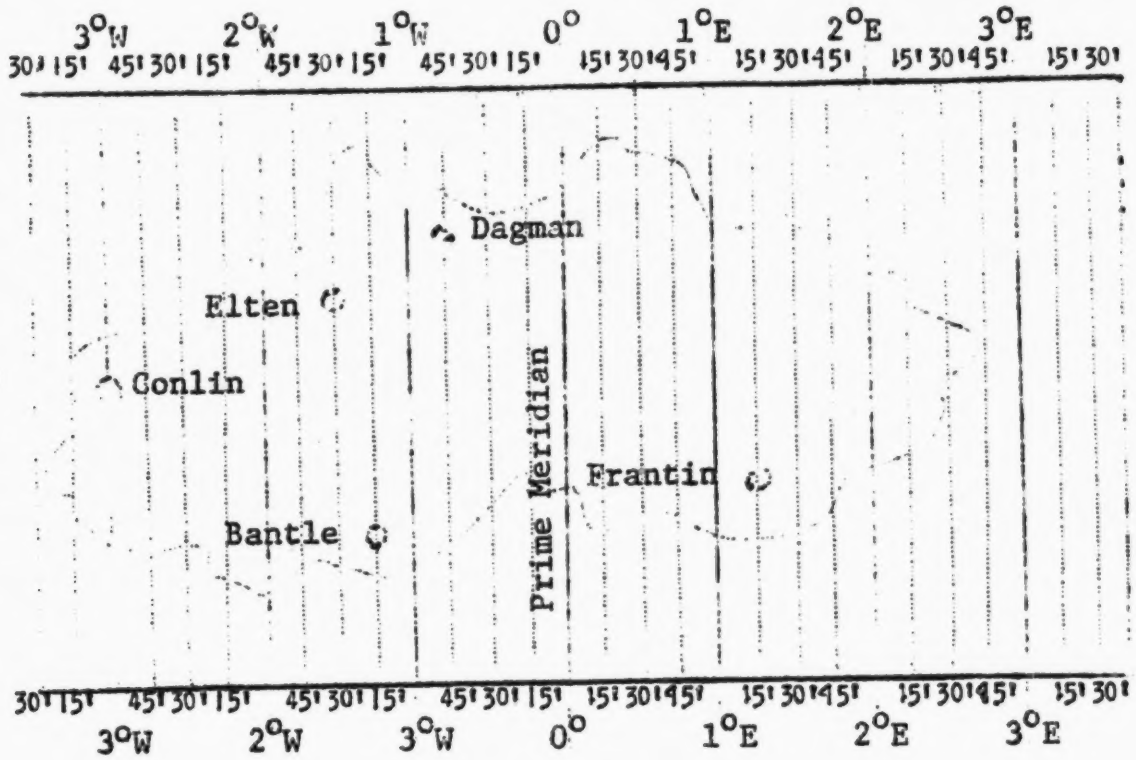


Figure 11

8-35 On Figure 11 we have an imaginary map with with imaginary cities. See if you can read their longitudes. Use Figure 11 for the rest of this set. The longitude of Conlin is (?) ° (?) . 3°W

8-36 The longitude of Elten is (?) ° (?) ' (?) . 1°30'W

8-37 The longitude of Dagman is (?) ° (?) ' (?) 0°45'W

8-38 The longitude of Frantin is (?) . 1°15'E

8-39 The longitude of Bantle is (?) . 1°15'W

Error Rates Per Frame by Grade and Ability Level

Frame Number	5 Low N=18	5 Ave. N=16	5 High N=18	6 Low N=9	6 Ave. N=19	6 High N=20	7 Low N=12	7 Ave. N=14	7 High N=5
8-30	22	0	6	11	5	0	0	0	0
8-31	6	6	6	11	0	0	0	0	0
8-32	22	6	0	0	11	5	0	7	0
8-33	22	13	0	11	11	0	0	7	0
8-34	17	19	6	11	11	0	8	0	0
8-35	33	50	28	44	26	5	17	7	0
8-36	39	38	23	44	26	10	25	21	0
8-37	61	31	17	44	32	10	17	0	0
8-38	22	25	11	22	26	5	17	0	0
8-39	33	19	11	44	42	0	8	0	0

A. Identify those frames judged bad and for which students

Bad Frames	Which Students

B. What caused frames to be faulty?

C. WHAT NEXT STEPS WOULD YOU TAKE TO MODIFY FAULTY FRAMES?

Test Over Measurement

Part I. Foundations

Items appearing in Part I of the test are designed to assess knowledge that is basic to the use of measurement in instructional systems development and research. In responding to these items place a T in front of the items which are true and an F in front of those which are false.

____ 1. Instructional research and instructional evaluation refer to essentially the same process.

____ 2. Demonstrating the effectiveness of an instructional system in one school setting does not mean that it will be effective in another.

____ 3. The aim of instructional evaluation is to determine whether a particular instructional system brings about the educational outcomes (behavioral objectives) that are intended to derive from it.

____ 4. Persons interested in instructional systems evaluation must become or must rely heavily upon a person competent in measurement in the behavioral sciences.

____ 5. Because of the "inexactness" of measurement in education and the behavioral sciences two or more measures should be used to assess any characteristic or outcome that is being considered in a particular study.

____ 6. The concepts of reliability and validity enter educational measurement only because constant error appears in all such measures.

____ 7. The concepts of the relevance, representativeness and fidelity of items in a measure have as much to do with the problem of constant error as does the concept of "construct" validity.

____ 8. The control of "random" error in measurement is one of the most bothersome and difficult problems that educators face in carrying out instructional research and evaluation.

_____ 9. The essential difference between measurement in the physical sciences and the behavioral sciences lies in the fact that physical sciences rely upon direct measurement, i.e. measurement of observable properties, while the behavioral sciences rely upon indirect measurement, i.e., measurement of "indicants" of inferred properties.

_____ 10. The accuracy of a measure is synonymous with its reliability.

Part II. Applications

Items appearing in Part II of the test are designed to assess the ability to apply basic knowledge about measurement to the solution of tasks demanding of that knowledge. In responding to the first item identify the elements (properties, traits, characteristics, outcomes) that can be measured only indirectly, i.e., that are hypothetical constructs. Do this by placing a check in front of these elements.

_____ Ability to solve story problems in mathematics

_____ Knowledge of ancient history

_____ Personality

_____ Intelligence

_____ Anxiety

_____ Time required to run the hundred yard dash

_____ Considerateness

_____ Orientation to the use of questions

_____ Citizenship

In responding to the second item in part II of the test indicate the level(s) of measurement (column 2) that are <u>appropriate and feasible within a school setting</u> for the measurement of the cognitive outcomes listed in column 1. Do this by placing the number descriptive of the level(s) of measurement in front of the cognitive outcome that is to be measured. Where more than one level is appropriate <u>rank them according to the power of the data that would come from each,</u> listing the most powerful first.

_____ Rules governing basketball	1. Knowledge level
_____ History of the Eskimo	2. Situational response level 1: Described criterion behavior
_____ Sensitivity to the feelings of others	3. Situational response level 2: Related criterion behavior
_____ Competence in math	4. Situational response level 3: Isomorphic criterion behavior
_____ Competence in marbles	
_____ Use of good table manners	
_____ Reading skill	
_____ Writing skill	
_____ Self confidence	
_____ Tolerance of individual differences	

Part III. Instrument Development

Items appearing in Part III of the test are designed to assess knowledge that is required in order to develop instruments for use in educational measurement. In responding to the first item, match the various attributes of a measure that are listed in column 1 with the phrase in column 2 that most appropriately describes the kind of evidence required in support of that attribute.

_____ Relevance	1. Theoretical clarity of items
_____ Representativeness	2. Conceptually appropriateness of items
_____ Fidelity	3. An individual's scores on a test taken twice with two weeks intervening
_____ Reliability	4. An individual's scores on alternate forms of a test
_____ Construct validity	5. The correlation between an individual's performance on two measures that are known to be related
	6. The extent to which an item differentiates between those scoring high and low on a test
	7. The extent to which an item calls for behavior that is isomorphic to the property that is being measured

In responding to the second item in this part of the test indicate the class(es) of measurement (column 2) that are <u>appropriate and feasible within a school setting</u> for the measurement of the cognitive outcomes listed in column 1. Do this by placing the number descriptive of the class(es) of measurement in front of the cognitive outcome to be measured. Where more than one class is appropriate <u>rank them according to the power of the data that would come from each</u>, listing the most powerful first.

____ Rules governing basketball	1. Interview
____ History of the Eskimo	2. Systematic observation
____ Sensitivity to the feelings of others	3. Standardized objective measures (Paper and Pencil)
____ Competence in math	4. Standardized projective measures (Paper and Pencil)
____ Competence in marbles	5. Teacher-made tests (Paper and Pencil)
____ Use of good table manners	6. Unobtrusively obtained products and/or records
____ Reading skill	7. Unobtrusive observation
____ Writing skill	
____ Self confidence	
____ Tolerance of individual differences	

CRITERION TEST: EXPERIMENTAL DESIGN

Directions: Read the proposal extract and answer the questions that follow.

III. Objectives

The primary objective of the proposed research is to determine whether or not student attitudes towards teaching objectives included in teacher education programs are effectively altered after they have had experience in simulated settings. The experimentation will be designed to answer questions which are specific to the particular experiences included in the materials. The simulation problems are, in this case, limited to situations of a personal-social nature.

Specific questions to be answered are the following:

1. Will the experiences provided through individualized instruction in the simulation facility (as described by Kersh, 1963), produce changes in attitude in a positive direction toward the subject matter of educational psychology?

2. Will changes in attitude become evident after the learner has had experience with one program of 20 problem sequences?

3. Will changes in student attitude maintain in strength following the termination of the learner's experience in the simulated setting?

IV. Procedure

A. General Method and Research Strategy

1. Sample Plan and Procedure. The experimental subjects will be selected from the students at Oregon College of Education majoring in elementary education. They will complete their instruction in the classroom simulator within one academic year of their practice-teaching experience or internship. The subjects will be screened on the basis of previous educational background and experience to insure homogeneity in this regard. Also, they will be screened on the basis of their performance on the pretest of attitude toward specific teaching objectives selected from those included in education courses. In so far as possible, only those students whose performance on the pretest indicates that they are neutral or negative toward the specific teaching objectives will be included. Subsequently, the subjects will be assigned to either

the experimental or the control group randomly on the basis of scholastic aptitude, sex, and other selected variables which otherwise might bias the findings.

2. Treatments. The classroom simulation technique under consideration attempts to create for the student teacher all of the relevant features of a single classroom situation.

In brief, the instructional procedure which has been developed for experimentation with the simulation materials is as follows: First the student teacher (T) is oriented to the simulation facility and to the procedure, then he is given a performance test in the simulated classroom using one of the three programs. The orientation and pretesting procedure takes approximately one and one-half hours per subject. Next, T is given the actual instruction in the simulation facility. The filmed problem sequences of actual classroom situations are presented and T is requested to enact his response to each. Depending upon the reaction of T, the experimentor (E) selects and projects one of two or three alternative feedback sequences.

3. Controls. The control group will be treated in every respect the same as the experimental group except the individuals in the control group will not experience instruction in the simulated setting. Differences in attitude between the experimental and control groups may be attributed only to experience in the simulation facility.

B. Data Types to be Gathered and Methods to be Used.

As is indicated above, the experimental group will undergo experience in the simulation facility which may be conveniently interrupted at three points: (1) at the end of the pretest period which includes the first 20 problem sequences; (2) after the instructional period, and, (3) after the post-test which terminates the experience in the classroom simulation facility. Criterion tests will be administered to individuals in the experimental group before their experience in the simulation facility begins, and after each of the instructional phases indicated above. Approximately six weeks after termination of the simulation experience, the criterion test will be administered once again. Individuals in the control group, which will not have experience in the simulation facility, will be tested on a time schedule approximating that of individuals in the experimental group.

QUESTIONS:

1; What is the experimental unit?

2. What is/are the experimental treatment(s)?

3. What is the method of assignment?

4. Diagram the design using R's, X's, and O's.

5. List sources of invalidity that are accounted for.

6. List sources of invalidity that are not accounted for.

7. Redesign the proposal, give both new diagram and brief explanation.

Data Analysis I

Criterion Examination

1. Assume that the numbers 6, 13, 24 were taken from a ratio scale. Which of the following sets of numbers would be appropriate substitution?

   a. 13, 20, 31
   b. 24, 52, 96
   c. 11, 25, 47
   d. 1, 6, 14

2. If the numbers 4, 17, 43 were taken from an ordinal scale, which of the following sets would be an appropriate substitution?

   a. 1, 2, 3
   b. 4, 16, 12
   c. 13, 10, 26
   d. none are appropriate

. If the numbers 6, 21, 24 represent an interval scale which set of numbers would be an appropriate substitution?

   a. 11, 40, 45
   b. 12, 42, 48
   c. 18, 63, 72
   d. 21, 35, 39

For each of the following kinds of measures indicate whether the scale is nominal, ordinal, interval, and ratio

4. Human age in years. _____

5. IQ _____

6. Numbers on pages in a book _____

7. Notes on the musical scale _____

8. Temperature on a centigrade scale _____

9. Elapsed time in seconds _____

10. Calendar years _____

11. An investigator wished to determine whether physical coordination training was effective in improving reading effectiveness. He selected a sample of "below grade placement" readers and gave them 20 hours of training in lateral coordination. A second sample was chosen from the same pool of low readers and given no training. For analysis purposes he should consider the samples

    a. independent

    b. related

12. A second investigator studying the same problem selected only one group of low readers and gave them training. He then compared pretraining and post-training reading performance. His samples should be considered

    _____

13. A third investigator thought that differences in training effectiveness might be expected for boys and girls. He designed his study to have training and no training groups of boys and girls. How many samples would be required for analysis purposes?

    _____

14. The null hypothesis which states that "the differences between means and variances of samples are no greater than differences due to the vagaries of random sampling from a single, normally distributed, infinite population," is best suited for

    a. causal-comparative studies
    b. experimental studies
    c. exploratory studies
    d. studies of physical characteristics only.

15. Causal-comparative studies differ from experimental studies in that

    a. Causal-comparative studies look for differences while experimental studies only look for change.
    b. Causal-comparative studies attend to differences in means and variances while experimental studies attend only to differences in means.
    c. Causal-comparative studies seek explanations on the basis of some characteristic of subjects, while experimental studies seek to determine effects of an additional influence.
    d. The two are synonymous.

16. All too often investigators state their null hypothesis merely as "the samples did not differ." This leads to confusion because

    a. The samples are not adequately described.
    b. The dependent variable is undefined.
    c. The analysis technique is unstated.
    d. The basic assumptions of sampling are omitted.

For each of the following research problems indicate which null hypothesis (I, II, or III) is most appropriate.

17. An investigator wished to determine if right-handed or left-handed baseball pitchers revealed greater eccentricities as measured by Karl Olliver Obvious Key Induction Examination. He chose random samples of 50 right-handed and left-handed pitchers from rosters of the teams in the American, National, and Pacific Coast leagues.

    _____

18. After selecting three random samples of sixth grade students, an investigator gave one group intensive training in problem solving, a second group a similar amount of training in logic, and no training to a third group. He then tested the creative abilities of the three groups.

    _____

19. An investigator wished to determine whether school administrators were more effective after completing his course. He watched his class members with other administrators in his state on the basis of sex, age, years of administrative experience, and number of hours of graduate credit.

    _____

20. An investigator wished to varify his observation that boys were more quantitatively inclined than girls. He selected random samples of 10th grade boys and girls enrolled in his high school.

    _____

Data Analysis II

Criterion Examination

For each of the following research situations describe the appropriate analysis technique.

1. The investigator wished to determine whether or not achievement in arithmetic, as measured by a standardized test reporting scores in grade placement equivalents was related to nonverbal I.Q.

2. An investigator asked the question "is college attendance predicted by high school grade point average, size of graduating class, and SAT verbal scores?"

3. A group of judges observed teaching behavior exhibited by 25 student teachers and ranked them according to their effectiveness. The investigators wished to determine if these rankings were related to average grades in professional courses received by the subjects.

4. An investigator determined the validity of his test by showing that persons who scored higher on his test completed their degree programs while those who scored lower did not complete their degrees. This relationship could best be described by:

5. To evaluate the effectiveness of a set of instructional materials, the researcher administered pre- and post-training tests (25-item, multiple-choice test) to a group of college freshman English students.

6. A college student personnel officer wished to know whether purchase of activities tickets differed among students living in dormitories, living in off-campus apartments or commuting from home.

7. Reaction times were recorded for three types of students, at four different times of the day, under two temperature conditions for five consecutive days.

8. A college political science professor was interested in determining whether men or women tended to participate more frequently in anti-Viet Nam demonstrations held on campuses. All students enrolled in political science courses were polled.

9. A biology instructor teaching two sections of bacteriology required weekly lab attendance for members of one class and compared their performance on his final exam with performance of the second class which experienced no lab sessions.

10. A sales manager was interested in determining which of several characteristics (annual income, age, size of family, etc.) were most accurate in differentiating Cadillac buyers from Corvair buyers.

11. A dean of women postulated that women enrolled in the College of Education were more attractive than women enrolled in the College of Arts and Sciences. Over a five year period she recorded the college affiliation of all women who were finalists in the 10 separate beauty contests held each year.

12. A curious physiological psychology major wished to determine whether scholastic aptitude (SAT verbal score) was related to sex (male and female).

V

13. A college golf coach wished to determine whether there was a relationship between the order of finish in his conference tournament and season average scores of his team members.

14. Ten pairs of identical twins were identified by a psychologist. At random one twin from each pair was assigned to attend nursery school for one term. At the end of the term the psychologist obtained measures of social adaptivity for all 20 twins. Scores on the social adaptivity scale were such that they could be ranked in order of absolute magnitude.

15. An investigator wishes to determine whether the 20 items on his test differ in difficulty. He administers the test to 75 subjects and records pass-fail information for each itme for each subject.

16. An investigator wished to determine whether there was any association between social class status and choice of high school curriculum. In a large high school he recorded the number of students in each of five social classes which chose each of three curricula.

APPENDIX B

Evaluation Sheet

We need to know how well the ideas and issues in this manual are communicated to you. You are the test audience for this material. To remove or strengthen the weak spots, to retain or improve the strong ones (if any), an account of your learning experience as you read these sections is crucial. Use this sheet as you study and jot down your reactions. Don't be concerned with typographical errors. We're concerned with how the message is coming through.

SECTION # _____ TITLE _____

Give topic, paragraph or sentence, page	Importance Rate 1 2 3 4 5 Low - High	Clarity Rate 1 2 3 4 5 Low - High	Suggested Improvements

Over-all Rating of the Section: Use a 5-point Scale

Important					Understandable				
1	2	3	4	5	1	2	3	4	5
Very Low				Very High	Very Low				Very High

(Circle one) (Circle one)

PLEASE PUT ANY ADDITIONAL COMMENTS ON BACK